# INDUSTRIAL DEVELOPMENT IN INDIA

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EDITOR'S NOTE

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A 15-minute radio talk of the same title as this article was recently given over the radio by Dr. Mitra.

The notion seems to prevail in this country that the material progress of India is of comparatively recent growth, that the application of such sciences as engineering and chemistry to increase human comforts was unknown in that country, and that only as a result of recent contact with the West, her industrial advancement has at all been made possible. But to anyone who is even casually familiar with Indian history, it will be apparent how erroneous is this notion.

There is evidence that Babylon traded with India in 3000 B. C.; Mummies in Egyptian tombs, dating from 2000 B.C., have been wrapped in Indian muslin that the world's craving for super- is well known that the world's craving for superfine textiles was satisfied until comparatively recent times with the famous Dacca muslins and other products of the Indian looms.

Ample also are the evidences of a thriving metallurgical industry which not only supplied the home market, but also the markets outside the borders of India. It was the Indian "wootz" or steel that formed the starting point in the making of the once famous Damascus blades; and not so long ago it was used in the making of cutlery in England.

The famous Iron Pillar of Delhi, which is at least fifteen hundred years old and weighs about ten tons, the immense iron grinders of the Jagannath Temple at Puri, and the twenty-four-foot wrought-iron gun at Narvar are but a few of the many relics of the iron and steel industry. Incidentally, the Delhi Pillar does not show a speck of rust on it even today, exposed as it has been to the stresses of weather for centuries.

We also see, until the beginning of the nineteenth century, the existence of a thriving shipbuilding industry in Bengal. The boats made at the ports of Calcutta and Chittagong sailed as far as Java and China and plied regularly between the Ganges and the Thames.

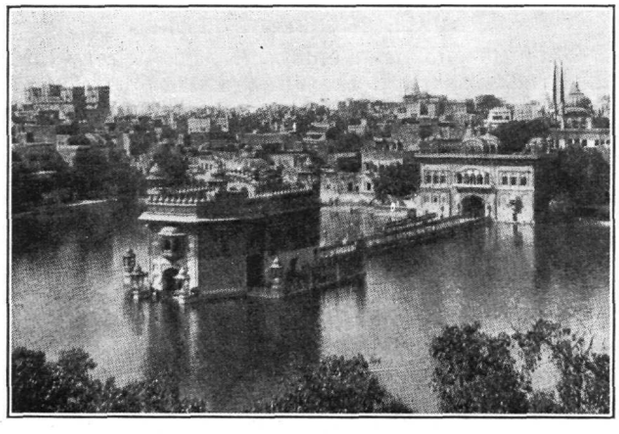
A recent excavation work done by an eminent Hindu archaeologist, at Mahenjo-daro, in Sind, has unearthed some remarkable relics of an ancient civilization which cannot fail to interest the engineer. Reference is made to the discovery of a group of cities that must have thrived on the river Indus at least 5000 years ago and which luckily have been found well preserved. A modern engineer walking through these cities cannot but admire the town planning, the skill in building construction, and the sanitary engineering schemes of the ancient Hindus. The most remarkable feature, considering the antiquity of these cities, is the provision of a well-devised underground drainage system. Other marvels of building construction such as the famous Taj Mahal and the temples of Southern India, are too well known to be mentioned here.

From what has been said above, it will be apparent that until about a century and a half ago, India was a thriving industrial country and not merely an agricultural country. What is known as the Industrial Revolution of the world began toward the close of the eighteenth century when James Watt invented the steam engine in 1766; the weaver Hargraves, the spinning jenny; the barber Arkwright, the spinning machine; and the weaver Crompton, the "mule." But the full effect of these discoveries, and particularly the revolutionary changes that were brought about by the steam engine, began to be felt only at the beginning of the nineteenth century. During the same period India was passing through a great cataclysm. The supremacy of the reigning power was on the wane, and foreign invaders were at her doors. Whatever other far-reaching effects were brought about by this conflict, for our purpose it will be sufficient to know that when the storm was over, India's industrial life was ruined, and she was relegated to the position of having to depend almost entirely on agriculture.

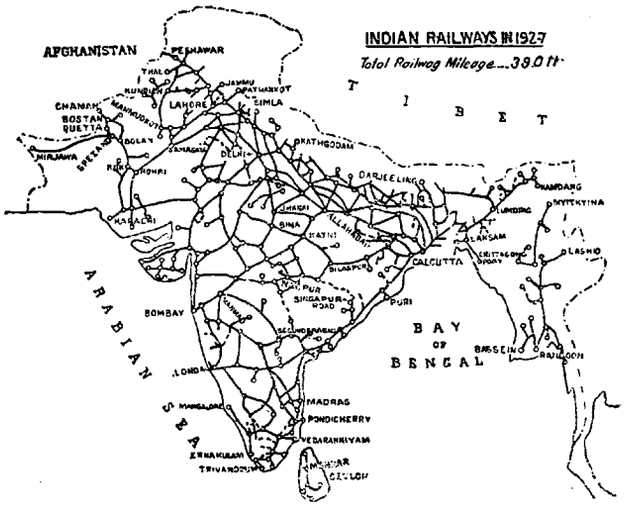
This background will serve to indicate why the discovery of the steam engine, which revolutionized social, political, and industrial systems of almost every country on the face of the earth, failed to show any apreciable effect on India for a long time. However, the effects at last began to be manifested on the Indian industrial horizon; and, from the late nineteenth century, India began its slow but steady march on the industrial path. The last war gave a tremendous impetus to its pace; and today, according to the statistics compiled by the League of Nations, India is the eighth largest industrial country of the world and second largest in Asia.

One of the earliest successful engineering projects in India was the railroad. The tracks laid between Calcutta and the northeastern section of the country followed approximately the direction of the Grand Trunk Highway constructed during the administration of the king Sher-Shah. The country today is fairly covered with a network of railroads.

The telegraph and telephone systems came to



Indian Architecture



Railway Map of India

be developed almost simultaneously with the railroads; and recently long distance telephone has been making rapid headway.

Unlike the progress of the steam engine in India, that of electricity has been comparatively encouraging. Almost all the big mines use electricity as do the iron and steel, the jute, the cotton, and many other industries. It may be mentioned in passing that jute is a monopoly of India. No other country of the world grows this fibre, which is used in the making of burlap.

In the vicinity of the coal mines, the power plants are steam operated, while in other parts of the country hydro-electric plants are coming into prominence. As the country has a large area, it has certain advantages in the matter of transmission of power. One is that it is possible to have interconnection between large units serving different districts and maintaining a standard frequency. The consumer is thus insured of a steady supply of current, even if one unit should happen to fail.

The more recent discoveries like radio and airplanes are coming to be much used. There are projects under way to use air transportation in those places where, for geological and geographical reasons, other rapid methods of transportation have not yet proved very successful.

Since the opening of the new air service between Bombay and London, it is possible to cover the distance in seven days instead of fifteen, as required by steamships. There is also a scheme on foot to connect Bombay and Berlin by air. This journey will take only five days.

Speaking of radios, it may not be generally known that radio broadcasting and receiving was made possible by the researches of Dr. J. C. Bose, the noted Indian physicist and physiologist. Taking up the work where it was left on Hertz's death, Bose introduced many novel features such as the use of short waves and of a platinum-covered surface from and to which the alternating sparks could pass without oxidation. He also introduced many new materials for use in receivers which made automatic recovery of them possible. The way was thus paved for making compact receivers.

It was in 1895 that Dr. Bose first gave a public demonstration in Calcutta of his discoveries. Later they were also shown at a series of evening discourses at the Royal Society of England, before a distinguished audience which included Marconi, Oliver Lodge, and Lord Kelvin. Reporting these discourses, the *Electric Engineer* of England expressed surprise "that no secret was at any time made as to the construction of his apparatus so that it has been open to the world to adopt it for practical and probably money-making purposes." In spite of tempting offers of money by many well-known engineering firms to keep the process secret, Bose refused to do so. He even refused to take a patent, as repeatedly urged by an American admirer. Probably this meant the loss of a valuable industry to India.

Nothing is probably more appropriate than to mention the cotton-mill industry first, when one reviews the Indian industrial history, for it is one of the earliest industries established in India on modern lines. The establishment of steam-powered cotton and weaving mills is but the logical metamorphosis of an ancient art as demanded by the epoch-making discovery of James Watt.

While the first mill was established in Calcutta in 1838, it was not until 1853 that the foundation of the industry was firmly laid, when the enterprising merchant, Cowasji Nanabhoy Davar of Bombay erected in his native city a mill with 5000 throttle spindles. But the path of the Indian mill owners has not been strewn with roses. Theirs has been a bitter fight against great odds, since their finished products had always to meet unfair competition, particularly with Lancashire goods. But the recent abolition of the cotton excise duty which the Indian mill owners had to pay, and which was always a thorn in their side, will greatly help in the legitimate expansion of the industry to supply the home and the far eastern markets.

Turning now to the basic industry of iron and steel, it may be said that its rise and development have been more spectacular and meteoric. The first attempt to manufacture steel in India was made in 1830 by an Englishman, Josiah Marshall Heath, a friend of Charles Dickens. Heath's attempts failed, as they were bound to fail, for in the first place no forethought was given to the location of his plant site, which was far away from iron-ore fields, coal mines, and other sources of necessary raw materials; secondly, he tried to do the impossible by attempting to operate his blowing engines by bullocks. The net result of his failure was that the myth went around that it was impossible to manufacture steel in India. Attempts at making steel have been made since then from time to time, and these have met with varying success.

But, thanks to the broad vision and dogged determination of that prince and pioneer of the Indian industrialists, the late Mr. J. N. Tata, this important industry was at last firmly implanted. Tata, after graduating from a textile college, started a cotton mill of his own which was a success. Some of the novel features and radical changes he introduced into that industry would have been sufficient to make his name famous as a captain of industries. But he was yet to wear his "triple crown." "Big business" was a passion with him, and he was destined to become a pioneer in the hydro-electric power development of the

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country and also in the iron and steel industry. Another important achievement of his was the establishment of the Bangalore Research Institute at Bangalore, a research institution which has few equals in any country.

Wtih the aid of expert American help and after spending about two hundred thousand dollars of his own money in prospecting alone, Tata succeeded in locating one of the richest iron-ore deposits of the world, having a metal content of 60 to 69 per cent. Nature has endowed India with all the materials that are required for the manufacture of steel, and besides, these occur in close proximity to one another. The effect of these favorable factors is reflected in the comparative cost of delivering all the materials that are required for making one ton of pig iron. It costs $8.50 in India; $17.50 in the United States, and $18.25 in England.

After considerable deliberation, the plant was located where it had the two advantages of being at the junction of two rivers and also close to the

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sources of raw materials. The tract was cleared of forests, and almost overnight as it were, there sprang up a city of more than one hundred thousand inhabitants. Soon the blast furnaces, the open hearths, and the coke ovens were in operation. Jamshedpur, as the new city is called after the name of its founder Jamshedji Tata, is less than two hundred miles from the port of Calcutta, and the railroad connecting Calcutta and Bombay passes through it.

Since there is no question that the World War helped to consolidate the position of this new industry, it is frequently asked if it will be able to hold its own, now that the world is recovering from the economic strain of the War. To answer that question, mention may be made that recent geological surveys have unearthed an almost inexhaustible supply of high-grade iron ore and other raw materials. Besides, the demands of the cotton industry, the jute industry, and the railroads will be sufficient to keep many a furnace busy. The tendency of the iron and steel industry in every country today is not only to own the mines from which come the raw materials but also to own, or at least have a controlling voice in, the industries that depend on steel. So we find in India the growth of the latter also with the steel industry as the nucleus. Then, again, it should not be forgotten that India is at the heart of the Asiatic Continent and this favorable geographical position is bound to make her a formidable rival of the European manufacturers in the Asiatic and African markets.

Finally, let us turn our attention to the various irrigation projects that have been recently completed or are under way. Both government and private enterprises are active here. While there sonal character makes it imperative to have artificial reservoirs. These reservoirs, then, may be made to supply irrigation canals and also to run the water turbines of a power station. This feature is characteristic of the Punjab, where many such hydro-electric plants are under construction. It is said that one of these stations when completed will become the second largest of its kind in the world.

Irrigation canals in India are of two kinds: (1) perennial, which derive their water from perennial rivers fed from the melting snow in the Himalaya Mountains, and (2) those that derive their water from artificial reservoirs. Even in the case of perennial canals, some sort of artificial barrages across the rivers are necessary, in order to insure a steady supply of water to the canals. One such barrage is the Sukkur Barrage about a mile long across the Indus. The canals below and above the barrage, having a total mileage of 5,000, will irrigate 5,000,000 acres at an initial cost of $60,000,000. There is a similar project under way in the Sutlej Valley.

Mention may be made in this connection of some of the immense dams that have been constructed. The Bhandardara dam, built three years ago, was then the largest of its kind, but was soon surpassed by the Exchequer dam of the United States, which in turn has been superseded by the Bhatgar dam near Poona City, opened last

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December. Its outstanding feature is the volume of masonry used, which is 21,000,000 cubic feet. Its cost was $625,000. When all these projects are completed the increase in area under irrigation will be from 28,000,000 acres to about 50,000,000 acres.

In this brief review of the industrial developments in India, it has been found impossible to do justice to all projects. However, it must have given some idea, at least, of the industrial renaissance that is going on there today.